CLAIMS

We claim:

1. A stent comprising:

a generally cylindrical stent body having proximal and distal opposing ends with a body wall having a surface extending therebetween;

an expandable filler material uniformly bonded to a thin sheet rolled upon itself having a circumference extending around a longitudinal stent axis; and

a barrier film for encapsulating said stent.

2. A stent as in claim 1 wherein:

the stent is manufactured from stainless steel.

3. A stent as in claim 1 wherein:

the stent is manufactured from Elgiloy.

4. A stent as in claim 1 wherein:

the expandable filler material is soluble.

5. A stent as in claim 1 wherein:

the expandable filler material is inert.

6. A stent as in claim 1 wherein:

the expandable filler material utilized is casein.

7. A stent as in claim 1 wherein:

the barrier film is manufactured from polypropylene.

8. A stent as in claim 1 wherein:

the barrier film is manufactured from polytetraflouroethylene.

9. A stent as in claim 1 wherein:

the barrier film is porous.

10. A stent as in claim 1 wherein:

the expandable filler material is pressure formed to the thin sheet.

11. A stent as in claim 1 wherein:

the stent is crimped onto a catheter.

12. A stent as in claim 1 wherein:

a catheter is used for implantation.

13. A stent as in claim 1 wherein:

the barrier film is hermetically heat sealed.

14. A stent as in claim 1 wherein:

the stent, the expandable filler material, the thin sheet, and the barrier film are biocompatible.

15. A stent as in claim 1 wherein the expandable filler material utilized can be chosen from the group of superabsorbent polymers consisting of sodium polyacrylate and polyacrylamide.

16. A stent as in claim 1 wherein:

a angioplasty balloon is used for implantation.

17. A stent as in claim 1 wherein:

a thromboresistant coating is applied to the barrier film.

18. A stent as in claim 1 wherein:

heparin is applied to the barrier film.

19. A stent device as in claim 1 wherein:

the stent is used in conjunction with another stent.

20. A stent device as in claim 1 wherein:

said stent is utilized in procedures pertaining to animals.

21. A stent device as in claim 1 wherein:

said stent is utilized in procedures pertaining to humans.

22. A stent device as in claim 1 wherein:

the thin sheet is foil.

23. A stent device as in claim 1 wherein:

the thin sheet is polymeric.

24. A method for bonding the expandable filler material to the thin sheet according to claim 1 comprising:

unrolling the thin sheet through an embossing roll;

depositing the expandable filler material from a bulk feeder onto the thin sheet;

spreading with a doctor blade the expandable filler material uniformly on the thin sheet;

pressure bonding the expandable filler material and the thin sheet with a calendar rolls.

25. A method for longitudinally rolling the expandable filler material and the thin sheet and insertion into the stent according to claim 1 comprising:

cutting the bonded thin sheet and expandable filler material to the length and circumference of the stent;

rolling longitudinally the bonded sheet and the expandable filler material; and

inserting the bonded sheet and the expandable filler material into the stent.

26. A method for hermetically heat sealing the barrier film according to claim 11 comprising:

cutting the barrier film to the appropriate length;

folding the barrier film around the stent;

welding ultrasonically a U-shaped seam into the barrier film;

inserting the expandable filler material bonded to the thin sheet into the folded barrier film;

welding ultrasonically the barrier film and the expandable filler material bonded to the thin sheet on the U-shaped seam; and

folding the top of the U-shaped seam into the stent.

27. A detachable balloon comprising:

a balloon capable of assuming deflated and inflated states having at least one opening;

a crimp ring surrounding the outside circumference of the balloon opening;

a septum surrounding the inside circumference of the balloon opening covering the balloon opening; and

a rigid band surrounding the inside circumference of the septum.

28. A detachable balloon as in claim 27 wherein:

said balloon is disposed in and secured to a generally cylindrical stent body having proximal and distal opposing ends with a body wall having a surface extending therebetween.

29. A detachable balloon as in claim 28 wherein:

heparin is applied to the outside of the stent.

30. A detachable balloon as in claim 28 wherein:

a thromboresistant coating is applied to the outside of the stent.

31. A detachable balloon as in claim 27 wherein:

a plurality of attaching bands secure said balloon to said stent.

32. A detachable balloon as in claim 27 wherein:

an expandable filler material inflates said balloon.

33. A detachable balloon as in claim 27 wherein:

the expandable filler material is a solution of saline and expandable particles.

34. A detachable balloon as in claim 27 wherein:

the expandable filler material is polyvinyl alcohol.

35. A detachable balloon as in claim 27 wherein:

the expandable filler material is gelatin foam.

36. A detachable balloon as in claim 27 wherein:

the expandable filler material is n-butyl-cyanoacrylate.

37. A detachable balloon as in claim 27 wherein:

the expandable filler material is a gas.

38. A detachable balloon as in claim 27 wherein:

a diaphragm and a convex core ring seals said balloon.

39. A detachable balloon device as in claim 38 wherein:

a syringe and a plunger is used for deflation.

40. A detachable balloon as in claim 38 wherein:

a syringe is used for deflation.

41. A detachable balloon as in claim 27 wherein:

a catheter is used for implantation.

42. A detachable balloon as in claim 27 wherein:

a syringe is used for inflation.

43. A detachable balloon as in claim 27 wherein:

a syringe is used for deflation.

44. A detachable balloon as in claim 27 wherein:

a syringe and a plunger is used for inflation.

45. A detachable balloon as in claim 27 wherein:

heparin is applied to the outside of the balloon.

46. A detachable balloon as in claim 27 wherein:

a thromboresistant material is applied to the outside of the balloon.

47. A detachable balloon as in claim 27 wherein:

the balloon is latex.

48. A detachable balloon as in claim 27 wherein:

the balloon is silicon.

49. A detachable balloon as in claim 27 wherein:

the balloon is polypropylene.

50. A detachable balloon as in claim 27 wherein:

the balloon is polytetraflouroethylene.

51. A detachable balloon as in claim 27 wherein:

the rigid band is stainless steel.

52. A detachable balloon as in claim 27 wherein:

the rigid band is egiloy.

53. An internal ligation device comprising:

a housing;

at least one sharp each of said sharps having a pointed tip located at the proximal end and distal opposing end with a sleeve having a surface extending therebetween wherein the said proximal end is unattached wherein the distal end is placed inside of the housing;

at least one slide each of said slides having a proximal end and a distal end wherein the proximal end is unattached and wherein the distal end is placed inside of the sharps;

at least one cutting blade each of said cutting blades having a proximal end and a distal end wherein the proximal end is unattached and wherein the distal end is placed inside of the housing;

at least one suture, each of said sutures having a proximal end and distal end wherein the proximal end is folded over said slide and wherein the distal end is placed inside of the housing.

54. An internal ligation device as in claim 53 wherein:

a clamping mechanism is located above said sutures.

55. An internal ligation device as in claim 53 wherein:

a means for cauterization is used to sever the excess of the sutures.

56. An internal ligation device as in claim 53 wherein:

a plurality of plungers are used to control the internal ligation device.

57. An internal ligation device as in claim 53 wherein:

the sharps are stainless steel.

58. An internal ligation device as in claim 53 wherein:

the cutting blades are stainless steel.

59. An internal ligation device as in claim 53 wherein:

the housing is stainless steel.

60. An internal ligation device as in claim 53 wherein:

the clamping mechanism is polypropylene.

61. An internal ligation device as in claim 53 wherein:

the sharp sleeves are polypropylene.

62. An internal ligation device as in claim 53 wherein:

the slides are polypropylene.

63. An internal ligation device as in claim 53 wherein:

the sharp sleeves are preformed in a curved shape.

64. An internal ligation device as in claim 53 wherein:

the sutures are monofiliament.

65. An internal ligation device as in claim 53 wherein:

the sutures are braided.

66. An internal ligation device as in claim 53 wherein:

a catheter is used for implantation.

67. An internal ligation device as in claim 53 wherein:

there are 3 slides.

68. An internal ligation device as in claim 53 wherein:

there are 3 sharps.

69. An internal ligation device as in claim 53 wherein:

there are 3 sutures.

70. An internal ligation device as in claim 53 wherein:

there are 3 cutting blades.

71. A method for ligating a vessel comprising the steps of:

placing an internal ligation device within a vessel by percutaneous catheteral procedure;

advancing a plurality of sharp sleeves;

advancing a plurality of slides;

piercing the vessel wall with a plurality of sharps;

advancing the slides;

expanding a plurality of preformed sutures outside of the vessel wall;

retracting the slides to suture release surfaces;

shedding the sutures;

retracting the slides and the sharp sleeves inside the internal ligation device; and

tightening the sutures.

72. The method of claim 71 further comprising:

advancing the cutting blades wherein the sutures are severed on the top surface of the clamps.

73. The method of claim 71 further comprising:

cauterizing the sutures wherein the sutures are severed on the top surface of the clamps.

74. The method of claim 71 further comprising:

cauterizing the sutures bonding them together.

75. The method of claim 71 wherein:

plungers are used in order to control the internal ligation device.

76. An apparatus for dilating or occluding a vessel, the apparatus comprising:

a mechanical element that conforms to a cylindrical shape whose natural or unrestrained state is slightly larger than the intended inner diameter of the vessel following dilation, the element is restrained to a smaller diameter to allow placement to the target site using a percutaneous catheteral procedure, in the constrained state, the element exerts an outward force that, if unrestrained, would allow the element to expand to the natural state, the element is restrained mechanically by means of materials whose properties change over time due to

exposure to blood protein, serum, enzymes, or changes in pH, these materials dissolve, expand or undergo changes in their physical properties to allow the element to expand slowly to the natural state.

77. The apparatus of claim 76 wherein:

said mechanical element is a thin sheet rolled upon itself that is introducible to the inside of a vessel having expanded and contracted conditions, wherein in the contracted condition the thin sheet is in a multiple layer roll having a tendency to radially expand and having a smaller diameter extending around a longitudinal axis, said sheet radially expands having a larger diameter extending around said longitudinal axis in said expanded condition.

78. The apparatus of claim 77 further comprising:

at least one ring surrounds the outside of the thin sheet constraining the thin sheet in the contracted condition wherein said ring restrains the thin sheet from expanding radially.

79. The apparatus of claim 78 further comprising:

a porous barrier film controlling the ingress of fluid for encapsulating said thin sheet and said ring.

80. The apparatus of claim 79 further comprising:

a generally cylindrical stent body having proximal and distal opposing ends with a body wall having a surface extending therebetween wherein said ring surrounds said stent and said stent encompasses said thin sheet.

81. The apparatus of claim 80 further comprising:

an expandable filler material uniformly bonded to the thin sheet wherein exposure to liquid expands the expandable filler material occluding the larger diameter of the thin sheet in said expanded condition.

82. The apparatus of claim 81 wherein:

said expandable filler material is comprised of superabsorbent polymer.

83. The apparatus of claim 81 wherein:

said expandable filler material is comprised of hygroscopic polymer.

84. The apparatus of claim 78 wherein:

said ring is comprised of a material of which the mechanical properties diminish over time from exposure to a bloodstream.

85. The apparatus of claim 78 wherein:

said ring is comprised of a material of which the mechanical properties diminish over time from exposure to a blood protein.

86. The apparatus of claim 78 wherein:

said ring is comprised of a material of which the mechanical properties diminish over time from exposure to blood serum.

87. The apparatus of claim 78 wherein:

said ring is comprised of a material of which the mechanical properties diminish over time from exposure to enzymes.

88. The apparatus of claim 78 wherein:

said ring is comprised of a material of which the mechanical properties diminish over time from exposure to a change in pH.

89. The apparatus of claim 78 wherein:

said ring is comprised of a material that dissolves over time from exposure to the bloodstream.

90. The apparatus of claim 78 wherein:

said ring is comprised of a material that dissolves over time from exposure to a blood protein.

91. The apparatus of claim 78 wherein:

said ring is comprised of a material that dissolves over time from exposure to blood serum.

92. The apparatus of claim 78 wherein:

said ring is comprised of a material that dissolves over time from exposure to enzymes.

93. The apparatus of claim 78 wherein:

said ring is comprised of a material that dissolves over time from exposure to a change of pH.

94. The apparatus of claim 78 wherein:

said ring is comprised of a material that expands over time from exposure to the bloodstream.

95. The apparatus of claim 78 wherein:

said ring is comprised of a material that expands over time from exposure to a blood protein.

96. The apparatus of claim 78 wherein:

said ring is comprised of a material that expands over time from exposure to blood serum.

97. The apparatus of claim 78 wherein:

said ring is comprised of a material that expands over time from exposure to enzymes.

98. The apparatus of claim 78 wherein:

said ring is comprised of a material that expands over time from exposure to a change of pH.

99. The apparatus of claim 78 wherein:

said ring is comprised of a polymer having tensile strength in which the tensile strength attenuates with moisture absorption.

100. An apparatus for dilating a vessel, the apparatus comprising:

a sintered or porous tube wherein a first portion of said tube is closed and of reduced diameter such that the reduced diameter can be disposed inside of a channel of a second portion of said tube that is introducible to the inside of a vessel; and

an expandable filler material disposed inside of the channel of the second portion of the tube wherein exposure to liquid expands the expandable filler material forcing the first portion out of said channel abutting the tube to the inside of a vessel, thus expanding the vessel.

101. The apparatus of claim 100 wherein:

said sintered sheet is comprised of porous material.

102. The apparatus of claim 100 wherein:

said expandable filler material is comprised of superabsorbent polymer.

103. An apparatus for dilating a vessel comprising:

a thin sheet that is introducible to the inside of a vessel having an interior surface and an exterior surface, a plurality of cavities disposed on the interior surface and the exterior surface, the thin sheet having expanded and contracted conditions, wherein in the contracted condition, the thin sheet is in a multiple layer roll having a tendency to radially expand and having a smaller diameter extending around a longitudinal axis wherein the cavities disposed on the interior surface are coupled with the cavities disposed on the exterior surface in an aligned configuration forming a plurality of enclosed pockets, wherein in said expanded condition said sheet radially expands having a larger diameter extending around said longitudinal axis wherein the cavities disposed on the interior surface and exterior surface are in a misaligned configuration; and

at least one key disposed in said enclosed pockets wherein said key restrains said tube in the contracted condition and exposure to liquid dissolves said key.

104. The apparatus of claim 103 wherein:

said key is comprised of material that dissolves.

105. The apparatus of claim 103 wherein:

a plurality of keys have increasing dimensions allowing sequential expansion of the device.